Plasticity or local adaptation?: Survival of *L. parva* larvae in varying salinity

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PRECS Phenotypic Plasticity Research Experience for Community College Students

Objective

Understand what affects *Lucania parva*'s ability to tolerate salinity and find the limitations the species may have to tolerating it.

What you should know about me…

Tassell and Robertson (2015)

A Rainwater Killifish.
Usually around 22-38 mm in length.

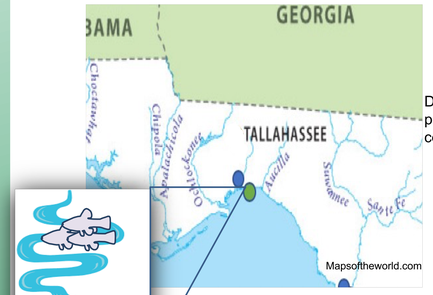
- The Rainwater Killifish has populations in Florida located in both fresh water (2 parts per thousand) and salt water (30 ppt)[2].
- Killifish are unique due to their ability to tolerate multiple salinities (euryhalinity)[3].
- Killifish commonly face unpredictable and fast-changing salinity levels. Hurricanes and droughts can increase salinity levels in bodies of water while floods can cause salinity to decrease[2].
- Killifish possess the anatomy that allows them to change salinity environments instantly and survive[1].

Why is this important to you?

1. As environmental stressors continue to amplify, Killifish are expected to outlast other species in unpredictably fast changing environments.
2. Data collected will allow us to analyze and compare other species to *L. parva* and predict how they will be affected by a changing environment.
3. Understanding this fish's biology will help with the conservation of aquatic ecosystems in Florida.

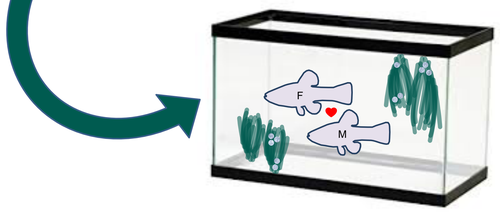
How we studied the Rainwater Killifish

Fish were collected from a freshwater population and a saltwater population from the same river drainage system in North Florida.



Drainages where fish populations were collected.

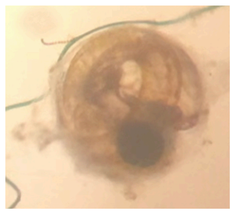
Male and female pairs from the same population were placed in 30 gallon tanks of either 2 ppt or 30 ppt to breed.



Eggs were collected from mops in tanks then placed in a randomized salinity of soft fresh water, hard fresh water, 30 ppt, or 60 ppt.

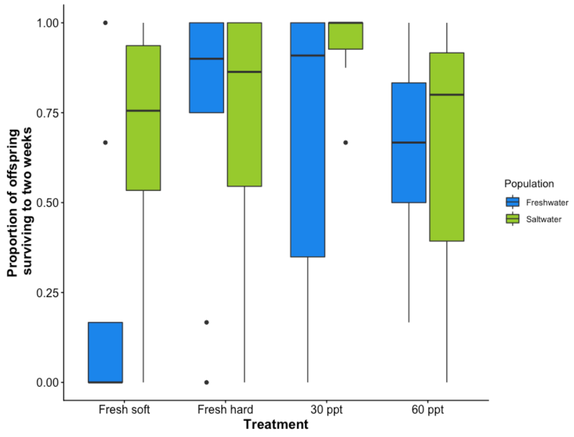
Eggs were checked 3-4x/week and their survival was recorded.

Survival was recorded until the offspring reached one month of age.



L. parva egg under microscope, mid-development.

Results from offspring survival trials



Early results revealed a consistent amount of larval deaths across all treatments. There were also considerable amounts of larvae that survived the entirety of the thirty day trial across all treatments. Once the larvae that were placed in the 60 ppt treatment reached the end of their trial, the mortality rate increased more than that of the larvae placed in other treatments.

The two population's response was significantly different to treatment one (P=0.017). The other three treatments act as preliminary support for the idea that the larvae's responses are plastic, though this still does not rule out the possibility of local adaptation. Increasing sample sizes will increase the power to detect local adaptation.

Future work

The sample size will be increased as fish continue to mate and yield more offspring.

Further research will be done to find the maternal effects on offspring and its implications on the data above.

More definitive data will be obtained to decide if phenotypic plasticity or local adaptation contribute to survival rates.

Over-winter survival of select offspring will be measured.

Predictions vs. Results

We expected to find that populations of *L. parva* are locally adapted as a function of salinity; meaning that offspring placed in the same salinity as that of their parent's natural habitat are expected to have increased survival.

Preliminary data and early trends suggest that during early larval stages, *L. parva* are plastic but the extent of their plasticity is limited as they cannot survive as well in extreme salinities.

References

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Acknowledgments

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